Broad-Nosed Weevils Feeding on *Centaurea solstitialis* in Turkey, with a Description of the New Species *Araxia cristofaroi* sp. n. (Coleoptera: Curculionidae: Entiminae)

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ABSTRACT During exploration for new biological control agents of yellow starthistle, *Centaurea solstitialis* L. (Asteraceae: Cardueae), in eastern Turkey, we observed four species of broad-nosed weevils (subfamily Entiminae) that are newly associated with this plant: *Epiphanops persicus* (Chevrolat), *Eusomomorphus oligops* Daniel, *Altonomus modestus* (Khnzorian), and *Araxia cristofaroi* sp. n. Host plants of these species are recorded for the first time. Adults of *E. persicus* feed on young spines of *C. solstitialis* capitula (flower heads), whereas *A. modestus* and *A. cristofaroi* feed on leaves of *C. solstitialis* rosettes. Large numbers of *E. oligops* adults were observed feeding on leaves of both *C. solstitialis* and Russian knapweed, *Acroptilon repens* (L.). The genus *Araxia* Khnzorian is transferred from tribe Brachyderini Schoenherr to the tribe Sciaphilini Sharp, and it is redescribed. Female genitalia of this genus were studied and described for the first time. The new species, *Araxia cristofaroi* sp. n., is described, illustrated, and compared with the only other known *Araxia* species: *A. mucronata* Khnzorian. A taxonomic key discriminating the two *Araxia* species was developed. The new species differs by having claws that are almost equal in length, thinner and longer protibiae, wider antennal scape, more slender rostrum, and shorter body length. *A. mucronata* is newly recorded for Turkish fauna.

KEY WORDS Curculionidae, yellow starthistle, taxonomy, new species, Turkey

Yellow starthistle, *Centaurea solstitialis* L. (Asteraceae: Cardueae), is an invasive alien weed in the United States that is the target of a classical biological control program (Maddox 1981, Turner et al. 1995, Sheley et al. 1999, Piper 2001, Pitcairn et al. 2004). The plant is native to southern Europe and western Asia, where it grows along roadsides and in disturbed grasslands (Komarov 1934, Klokov et al. 1963, Wagenitz 1975, Dostál 1976). The geographic center of origin of this plant species seems to be in or near Turkey, based on number of subspecies and close relatives. Exploration for arthropods that feed on this plant have been conducted previously in southern Europe, Greece, and Turkey (Zwölfer 1965, Rosenthal et al. 1994, Campobasso et al. 1999, Balciunas and Korotyaev 2007), and latest studies have been mainly in eastern and central Anatolia. Recently, more intensive explorations and field studies were conducted in eastern and central Anatolia, Turkey (Cristofaro et al. 2002, 2006; Gültekin et al. 2006; Smith and Drew 2006), in collaboration with other biodiversity studies (Gültekin and Korotyaev 2005, Gültekin 2007), which led to the discovery of the species reported in this article.

The genus of *Epiphanops* Reitter, 1895 is represented by three species that are distributed in Armenia, Iraq, and Turkey (Pelletier 2002). The genus *Eusomomorphus* Daniel, 1906 contains a single species, *E. oligops* Daniel, which is described from Cappadocia, Turkey, and apparently is endemic to Turkey (Dalla Torre et al. 1937). The genus *Altonomus* Desbrochers, 1907 has five species that are distributed in Armenia, Turkey, and Israel (Borovec 2003). The genus *Araxia* Khnzorian, 1957 contains a single species, *A. mucronata* Khnzorian, which is known only from Armenia (Khnzorian 1957). We found no information about the larval or adult host plants or biology of any of these species in the literature.

The purpose of this article is to describe the new species *Araxia cristofaroi*, revise the taxonomic position of *Araxia*, and provide new information on the ecology and food plants of the four Entiminae species that we found on *C. solstitialis*.

Materials and Methods

Field Observations. We surveyed naturally growing *C. solstitialis* at various locations in Turkey in summer 2002–2004. When we observed feeding damage on the plants, we made careful observations of what insects

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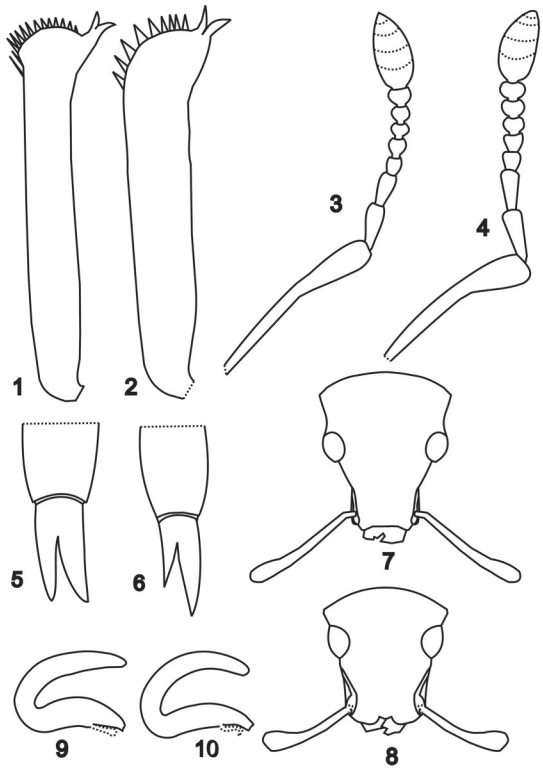


Figs. 1–10. *A. cristofaroi* sp. n. (1, 3, 5, 7, and 9); *A. mucronata* Khnzorian (2, 4, 6, 8, and 10). 1–2, left fore tibiae; 3–4, antenna; 5–6, right foreclaws; 7–8, rostrum with head; and 9–10, spermatheca.

seemed to cause the damage. Specimens were collected for laboratory experiments, and they were preserved for identification. We also examined ≈10 plants of the most abundant species at the site to determine on which the insect rested or fed.

Experiments. Adult insects suspected of feeding on *C. solstitialis* capitula were placed in screened rearing cages (28 by 28 by 30 cm) or in transparent plastic bags (25 by 40 cm) ventilated with small holes, and they were held at room conditions. We placed eight fresh undamaged flowerheads of *C. solstitialis* and two of *C. arvense*, which were collected at the same location as the insects, in each cage or plastic bag. A pair of adults (one male and one female) was placed in each cage or plastic bag, and we observed feeding damage after ≈24 h. Some insects were released in screen field cages (1 by 1 by 1 m) at Atatürk University, which contained 15 bolted yellow starthistle plants that had been transplanted at least 3 wk before.

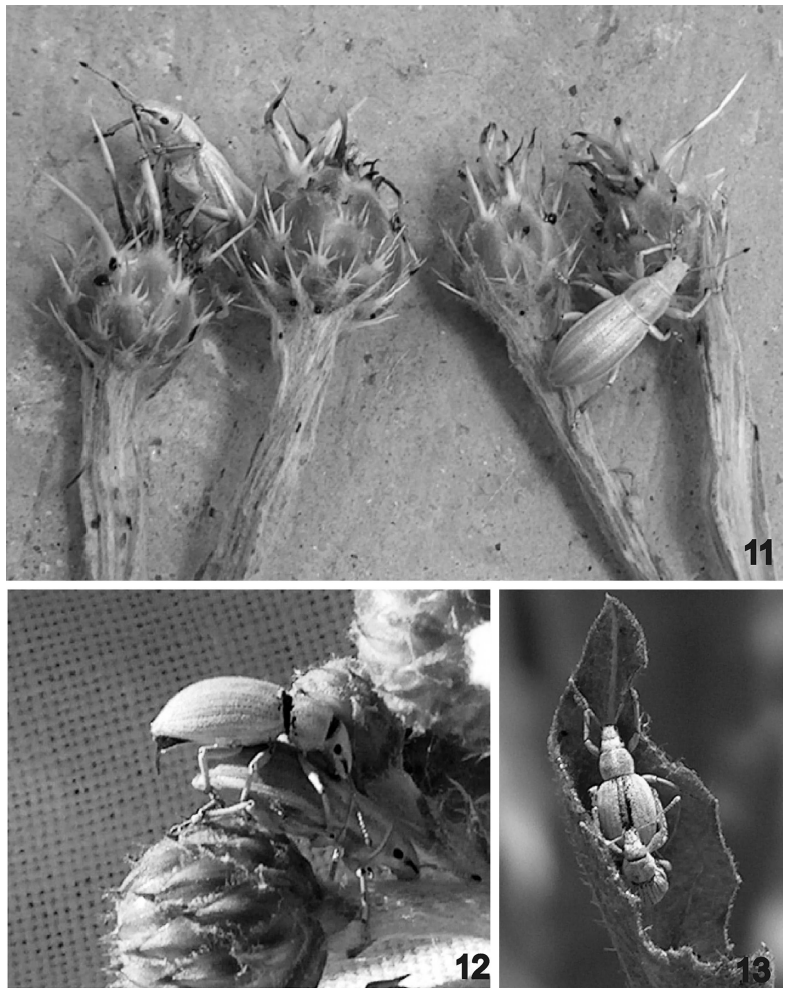
Systematic Work. Morphological terminology follows that of Oberprieler (1988). Measurements were made using an ocular micrometer at 100–175×, to the nearest 0.01 mm. Most measurements were made from above, but elytral length was measured from the dorsoanterior corner to elytral apex in lateral view on the left side. Total length of body was measured in profile from anterior margin of eye to the apex of the elytra. For *A. cristofaroi*, dissected female genitalia of the holotype were preserved in glycerol in a microvial on a separate card pinned below the specimen; those for the paratypes were embedded in Solakryl on the same card as the specimen. Type specimens are deposited at the following locations: Entomology Museum, Atatürk University, Erzurum, Turkey: holotype and two paratypes; Museo di Civico Zoologia, Rome, Italy: one paratype; Borovec Collection, Sloupno, Czech Republic: three paratypes; and Colonnelli Collection, Rome, Italy: one paratype.

Results and Discussion

Bionomics

***Epiphanops persicus* (Chevrolat).** On 4 July 2003, in a field on the campus of Atatürk University, Erzurum, Turkey (1,850 m), we observed capitula spines of *C. solstitialis* that had been eaten, and the remaining stubs had turned brownish (Fig. 11). Careful searching revealed four adults of *E. persicus* (Chevrolat, 1879) (=*Epiphanops dohrni* Faust, 1890) resting on capitula of *C. solstitialis.* On 7 July 2003 we observed adults of *E. persicus* feeding at the base of capitula spines on *C. solstitialis* at the same location. Usually only one or two adults were seen on a plant, and it was not easy to see weevils because they are well camouflaged. However, the spines on the flower buds damaged by adult feeding are easily noticed because the remaining stubs turn brownish. Mating was observed on both *C. solstitialis* and *Cirsium arvense* (L.) Scop. (Fig. 12). The dominant plants at this location were *C. solstitialis* and *Xeranthemum annum* L., and other plants included *Cirsium arvense*, *Onopordum bracteatum* Boiss. & Heldr., *Carduus nutans* L., *Tragopogon dubius* Scop., *Crambe orientalis* L., *Isatis glauca* Auch. ex Boiss., and *Lactuca* sp. Across the road from this location, *Artemisia* sp. was widespread and dominant. We examined all types of plants at both these locations to determine which were being eaten by *E. persicus.* We observed only two adults walking on *Artemisia* sp., and we saw no signs of feeding. On *C. solstitialis* we also observed adults of *Larinus curtus* Hochhuth, 1851 and *Ceratapion basicorne* (Illiger, 1807). This is the first report on the feeding behavior and food plant for *E. persicus.* In total, 17 specimens was collected. Adults ($n = 8$) placed in either cages or plastic bags with *C. solstitialis* and *C. arvense* capitula for 24 h damaged only spines of *C. solstitialis.*

***Eusomomorphus oligops* Daniel.** Large numbers of *Eusomomorphus oligops* Daniel, 1906 adults were found feeding on leaves of both *C. solstitialis* (Fig. 13) and *Acroptilon repens* (L.) DC. in Central Anatolia (18 km west of Kayseri, at elevation 1,020 m) on 9 June 2004. It was more common on *C. solstitialis* than on *A. repens*, and >40 specimens were collected at this small location. We observed up to six individuals on a plant, and mating behavior on these plants was common. Adults ate the outer margins of young leaves consuming all the tissue in a wide semicircular area. The plant community at this location included *C. solstitialis*, *A.*



Figs. 11–13. 11, *E. persicus* (Chevrolat), adults feeding on spines of *C. solstitialis*; 12, *E. persicus* mating on *C. arvense*; 13, feeding damage and mating of *E. oligops* Daniel on *C. solstitialis*.

repens (both dominant), *Beta trigyna* Waldst. & Kit., and *Crambe tatarica* Willd. Other weevils associated with *C. solstitialis* were *Bangasternus orientalis* Capiomont, 1874; *Larinus filiformis* petri, 1907; *Larinus curtus* Hochhuth, 1851; *Eustenopus villosus* Boheman, 1836; *Lixus scolopax* Boheman, 1836; and *Ceratapion basicorne* (Illiger, 1807).

Approximately 20 adults released in a field cage containing *C. solstitialis* plants at Atatürk University caused feeding damage, especially on young leaves, and mating was frequently observed. Adults were active for at least 2 wk; however, we did not see any sign of immature stages. This suggests that 1) either the females were in reproductive diapause or 2) the larval host could be a different plant species. For example adults of *Ceratapion basicorne* (Curculionidae) feed and mate on the plant soon after they emerge in June, but oviposition does not occur until the next spring (Smith and Drew 2006).

***Altonomus modestus* (Khnzorian).** We observed three adults of *A. modestus* (Khnzorian 1957) hibernating together under a rosette of the plant *Onosma sericeum* (Boraginaceae) around the root crown, 12 km south of Çat (near Erzurum) at 1,850-m elevation, in early spring (12 April 2002). One adult was active and feeding on a young rosette of yellow starthistle that had been transplanted for a field experiment (Smith et al. 2006) 8.5 km south of Çat at the same date. Another individual was found feeding on a *C. solstitialis* rosette at 13 km northwest of Aşkale (Erzurum) in early spring (12 April 2002). This is behavior similar to that of *C. basicorne*, which oviposits on rosettes in the spring (Smith and Drew 2006).

***Araxia cristofaroi* sp. n.** Adults of *A. cristofaroi* sp. n. were found feeding on rosette plants of *C. solstitialis* 12 km west of Bingöl, at 1,330 m elevation, on 6 May 2003 during a joint expedition, in which we (M.C. and L.G.) briefly examined rosette plants at several locations while traveling from northeastern to southeastern Anatolia. Usually, one or two individuals were observed on a rosette plant. In addition, we collected a few specimens on *C. solstitialis* 35 km northeast of

Bingöl, near Çobantaşı Village on the same date. The first location is a stony slope, and *C. solstitialis* was the commonest plant in an open area among scattered *Quercus* trees. On a subsequent trip on 25 April 2004 in the same region, we found the same species on *C. solstitialis*, and Dr. Enzo Colonnelli also collected the weevil on this plant. This confirmed our observation that *C. solstitialis* is a food plant for this species.

Taxonomy

Genus: *Araxia* Khnzorian, 1957

Araxia Khnzorian, 1957: 179.
Araxia: Alonso-Zarazaga & Lyal, 1999: 146.

Redescription. Body length: 4.2–5.6 mm (not included rostrum).

Body black, only frons dark brownish; femora and sometimes tibiae blackish, remaining part of legs and antennae brown reddish. All setae piliform, adherent, and semierect, two-colored—brownish and grayish.

Rostrum wider than long (Figs. 7 and 8), widest at base, in basal half very strongly tapered anteriad, in apical half parallel-sided. Epifrons regularly vaulted or feebly longitudinally impressed. Frons large, significant, but not separated from epifrons by raised line, almost reaching posterior border of scrobes in dorsal view, feebly irregularly depressed, shiny, glabrous, slightly angular in lateral view. Epistome not differentiated. Scrobes in dorsal view inconspicuous, furrow-shaped, visible only in apical half; in lateral view short, feebly widening posteriad, dorsal margin directed toward dorsal margin of eye, ventral margin feebly curved down, directed below ventral margin of eye. Rostrum in lateral view in the same plane as head, regularly vaulted. Eyes dorsally placed, convex, protruding from outline of head. Interocular space with fovea.

Antenna slender. Scape about as long as funicle without club, reaching anterior margin of pronotum, curved. Funicle slender with antennomeres 1–6 longer than wide (Figs. 3 and 4).

Pronotum wider than long, widest in midlength, with regularly arcuated sides and feebly constricted behind anterior margin; pronotal surface regularly vaulted without sculpture.

Procoxal cavities contiguous, semiglobular, placed significantly closer to anterior than posterior margin.

Scutellum well visible, triangular.

Elytra long-oval, with short mucro at apex, with straight base and without well-developed numeri. Striae punctate, intervals flat and wide.

Mesocoxae semiglobular, mesosternal process very narrow. Metacoxae transverse, separated by distance much smaller than transverse diameter of metacoxa.

All femora unarmed. Protibia at apex rounded, enlarged apically with two long spines at inner margin (Figs. 1 and 2). Meso- and metatibia with two similar spines at apical inner margin. Metatibial corbel long-oval, open. Tarsi slender with tarsomere 3 bilobed, strikingly wider than 2, ungular tarsomere of about equal length as 3. Claws coalesced in basal part, asymmetrical slightly or strikingly different in length and width (Figs. 5 and 6).

Ventrite 1 of same length as ventrite 2 and somewhat longer than ventrite 3. Ventrites 3 and 4 equally long. Suture 1 sinuous and fine, other sutures straight and deep. All ventrites sparsely covered by adherent, piliform setae.

Male genitalia. Males are unknown to us. Khnzorian (1957) cited a male in type series of *A. mucronata*, without any description of male genitalia or sexual dimorphism.

Female genitalia. Sternum 8 well sclerotized, with apodeme of medium length, less than twice longer than plate. Plate large, A-shaped, pointed, with well sclerotized apical margin bearing some short setae and with ill-defined basal margin. Hemisternite of ovipositor robust, tapering apically with apically placed long and slender, cylindrical stylus, bearing setae. Spermatheca U-shaped (Figs. 9 and 10) slender and long, with conspicuous, long and wide nodulus and almost invisible, very small ramus. Cornu long and slender, feebly curved.

Type Species. *Araxia mucronata* Khnzorian, 1957, by monotypy.

Taxonomic Position and Differential Diagnosis. There are few publications regarding the genus *Araxia* since the time of its description, and it was reported only once in a taxonomic catalog (Alonso-Zarazaga and Lyal, 1999) in the tribe Brachyderini Schoenherr, 1826. It was also placed in this tribe in the original description by Khnzorian (1957). However, *Araxia* lacks the characters typical for Brachyderini, i.e., rostrum of about the same width as head, creating one conical cylinder. *Araxia* shares characters with the tribe Sciaphilini Sharp, 1891, including: claws connate, without developed numeri, and antennal scrobes furrow-shaped in dorsal view. Therefore, we are transferring *Araxia* to the tribe Sciaphilini. In this tribe *Araxia* is very similar to genera *Chiloneus* Schoenherr, 1842 and *Chilonorrhinus* Reitter, 1915 because they all have a large, significant, shiny and glabrous frons. *Araxia* is easily differentiated from both these genera by antennal scrobes in lateral view that feebly widen posteriad, with dorsal margin directed toward dorsal margin of eye and ventral margin feebly curved down, directed below ventral margin of eye (*Chiloneus* and *Chilonorrhinus* have scrobes in lateral view furrow-shaped, with dorsal and ventral margin curved down below ventral margin of eye), frons not separated from epifrons by any significant elevated line (*Chiloneus* and *Chilonorrhinus* have frons visibly separated from epifrons by crescent-shaped raised line), slightly or significantly unequal length and width of claws (*Chiloneus* and *Chilonorrhinus* have claws of equal length and width) and from *Chiloneus* with body covered by piliform body vestiture (*Chiloneus* has body covered by rounded scales).

Araxia cristofaroi Gültekin et Borovec sp. n.

Type Material. HOLOTYPE: ♀, Turkey, Bingöl Prov., 35–40 km NE of Bingöl, Çobantaşı Vill, 1,350 m,

6-V-2003, L. Gültekin (Entomology Museum, Atatürk University, Erzurum). Paratypes: 2 ♀♀, Bingöl Prov., 12 km W of Bingöl, Bilaloğlu Vill., 1,330 m, 6-V-2003, L. Gültekin, (Entomology Museum, Atatürk University, Erzurum); 3 ♀♀, Turkey: Bingöl Prov., 12 km W of Bingöl, Bilaloğlu Vill., 1,330 m, 6-V-2003, M. Cristofaro (coll. R. Borovec); 1 ♀, Turkey, Bingöl Prov., 35–40 km NE of Bingöl, Çobantaşı Vill., 1,350 m, 6-V-2003, M. Cristofaro (Museo di Civico Zoologia, Rome); 1 ♀, TR (Bingöl) – m 1,200, Bilaloğlu, 38° 55′ 56″ N, 40° 22′ 23″ E, 25-IV-2004, E. Colonnelli, *Centaurea solstitialis* L. (coll. E. Colonnelli).

Additional Examined Material. 1 ♀, Nakhitchevanskaia ASSR, 8 km N Tachbuza, 2,000 m, 20-V-1988, Korotyaev (coll. J. Fremuth).

Description. Body length: holotype 4.53 mm, paratypes 4.19–4.63 mm (not including rostrum).

Entire body and femora black, frons dark brownish, tibiae, tarsi and whole antennae brown reddish. Elytra sparsely covered by 1) adherent piliform setae, brown with feeble bronze luster and grayish with feeble mother-of-pearl luster, irregularly scattered and 2) inconspicuous brownish piliform setae, in basal part semiadherent, in apical part semierect, creating a single row on each elytral interval. Pronotum and head with similar adherent setae. Pronotum with setae directed obliquely to midline and with irregular, narrow, longitudinal stripes of grayish setae on sides. Tibiae with short, grayish, erect setae; antennal funicle with short, semierect, grayish setae.

Rostrum 1.40–1.47 × wider than long, at base 1.29–1.35 × wider than at apex, in basal half strongly tapered anteriad, in apical half parallel-sided (Fig. 7). Epifrons regularly vaulted without any depression, finely, densely and regularly punctured, intervals between punctures shorter than their diameter. Frons large, wide, U-shaped, reaching almost posterior border, with feeble and shallow, irregular depressions. Rostrum in lateral view almost flat, frons slightly angular. Eyes small, strongly convex, significantly protruding from outline of head (Fig. 7).

Antenna (Fig. 3) slender. Scape slender, feebly curved behind midlength and very feebly regularly thickened in apical quarter, antennal club 1.3–1.4 × wider than scape at apex. Antennomere I 2.4 × longer than wide and 1.5 × longer than antennomere II, that is 2.3–2.5 × longer than wide. Antennomeres III and IV 1.5 × longer than wide, antennomeres V and VI 1.2 × longer than wide, antennomere VII isodiametric. Club slender, long.

Pronotum 1.24–1.32 × wider than long, widest in midlength with regularly rounded sides, feebly constricted behind anterior margin. Entire surface regularly, densely and finely punctate, intervals between punctures shorter than their diameter, shiny, without any sculpture.

Scutellum triangular, covered densely by grayish setae with greenish sheen.

Elytra long-oval, 1.55–1.59 × longer than wide, with feebly rounded sides and short mucro at apex. Striae punctate, intervals flat and feebly shiny.

Femora unarmed. Tibiae long and slender, anterior tibia 4.71–5.23 longer than wide at apex. Apex of protibia rounded, slightly enlarged at outer margin and strikingly enlarged at inner margin, with a fringe of short, fine, yellow setae (Fig. 1). Protarsus slightly more robust than metatarsus. Protarsomere II 1.1 × wider than long, protarsomere III 1.1 × longer than ungular protarsomere. Metatarsomere II isodiametric, ungular metatarsomere 1.1 × longer than metatarsomere III. Claws connate at base, asymmetrical, with only slightly unequal length and width (Fig. 5).

Female Genitalia. See description in generic redescription.

Etymology. New species is named in honor of Dr. Massimo Cristofaro (Biotech, ENEA C.R. Casaccia, Rome, Italy).

Differential Diagnosis. *Araxia cristofaroi* sp. n. is distinguished from the only known other species of that genus, *A. mucronata*, by the following key.

Key to the Species of the Genus *Araxia*

1. Claws only slightly unequal (Fig. 5) in length and width. Protibia long and slender (Fig. 1), 4.71–5.23 × longer than greatest width at apex. Antenna more slender. Antennal club 1.3–1.4 × wider than apex of antennal scape, scape feebly and regularly thickened to apex. Antennomere VII isodiametric (Fig. 3). Rostrum more slender (Fig. 7), 1.40–1.47 × wider than long with base 1.29–1.35 × wider than apex. Elytra more slender, 1.55–1.59 × longer than wide. Smaller species, body length 4.2–4.6 mm . . . . . *Araxia cristofaroi* sp. n.
- Claws significantly differ in length and width (Fig. 6). Protibia shorter and more robust (Fig. 2), 4.00–4.75 times longer than at apex widest. Antenna more robust, club 1.1 × wider than apex of antennal scape, scape abruptly thickened at apex (Fig. 4). Antennomere VII 1.2–1.3 × wider than long. Rostrum wider (Fig. 8), 1.35–1.44 × wider than long with base 1.21–1.26 × wider than apex. Elytra more robust, 1.41–1.49 × longer than wide. Larger species, body length 5.1–5.6 mm. . . . . *Araxia mucronata* Khnzorian

Other Examined Material of *A. mucronata*. 1 ♀, NE Turkey, SE of Trabzon, Gümüshane, S slope Zlulfe-Dagh, 2,000–2,700 m, 9-VI-1996, G. E. Davidian leg. (Entomology Museum, Atatürk University, Erzurum); 1 ♀, Anatolien, Prov. Malatya, Darende, 1,660 m, 29-IV-1975, leg. Holzschuh and Ressl (coll. J. Fremuth).

A. mucronota was described and until now known only from Armenia; it is a new species in the fauna of Turkey.

Acknowledgments

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